Perceptual abilities in relation with motor development during the first year of life

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Introduction

Phoneme categorization

•Infants show discrimination of syllables as soon as 1 month of age despite speaker variability *(Eimas et al., 1971; Eimas, 1974*).

•**Problem of invariance**: ability to detect a consonant in ≠ syllable contexts despite acoustic variations: argument for the Motor Theory *(Liberman et al., 1967).*

•A recent study claimed that 6-month olds but not 3-month olds solve the invariance problem *(Hochmann et al.,2014)* and argue against a motor interpretation since babbling occurs later.

- *Standard: (baseline)* ***bead-bad-boat*** *(target)* ***boo***
- *Deviant: (baseline)* ***bead-bad-boat*** *(target)* ***due***

Greater pupil dilatation for the deviant target than for the standard target.

However

•Are infants detecting invariance or just acoustic differences between stimuli?

•Does babbling only start at 6 months?

Goals of the present study

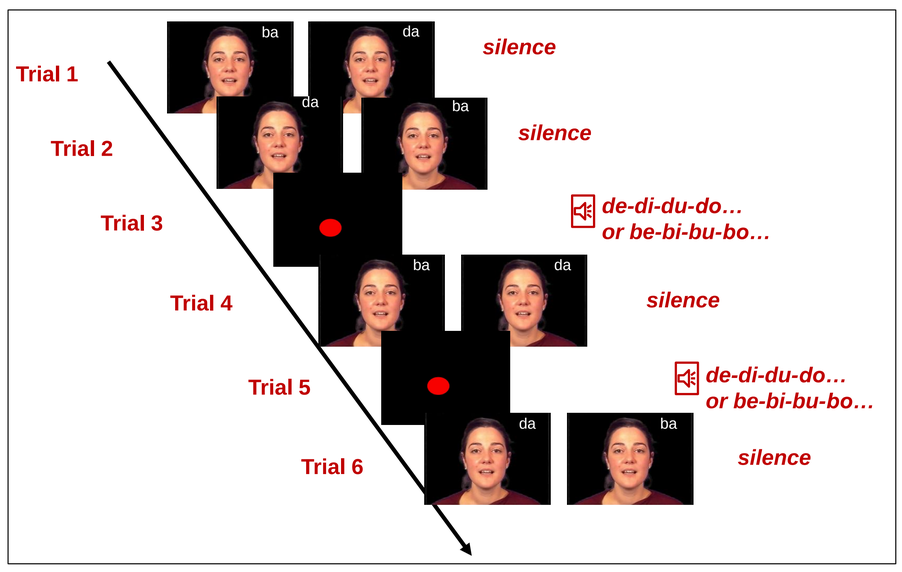
•Assess the ability to detect invariants and the role of motor knowledge in 6-to 12-month old infants.

Methods

Participants: 41 6- to 12-month old infants.

- 12 6months (8M), mean age= 6.45, sd= 0.1.
- 14 9mo (7M), mean age= 9.47, sd= 0.16.
- 15 12mo (6M), mean age= 12.48, sd=0.19.

Intersensory matching procedure *(Pons et al., 2009)*



Parental questionnaire assessing infants' production abilities
29 infants out of 41: 6 6mo, 11 9mo, 12 12mo

Hypotheses

- If infants have plosive categories they should associate the sound in one vocalic context with the visual gesture in another vocalic context
- If motor knowledge plays a role this should vary according to babbling abilities

Analysis: intersensory matching.

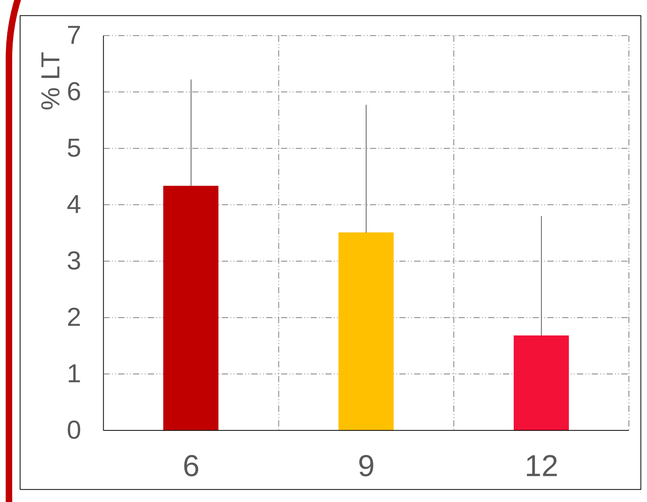
- % Looking Time (LT) for Baseline (1&2) and for Test (4&6).
- **Difference score** = %LT Test – %LT Baseline.

Analysis: production. Infants were classified as:

- **No Babbling**: no syllable or monosyllable
- **Canonical Babbling**: reduplicated CVCVCV with /a/
- **Variegated Babbling**: CVCVCV with different vowels

Preliminary Results

Effect of Age

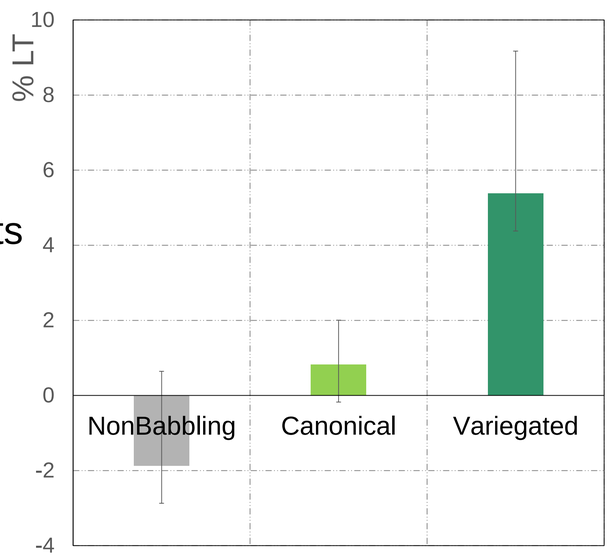


- **Plosive categorization abilities** *(p<0.05):* preference for stimulus presented during familiarization (Trials 3&5).
- Significant for 6-mo *(p<0.05)*, trend toward significance for 9-mo olds. *(p=0.07).*
- No significant between-groups difference.

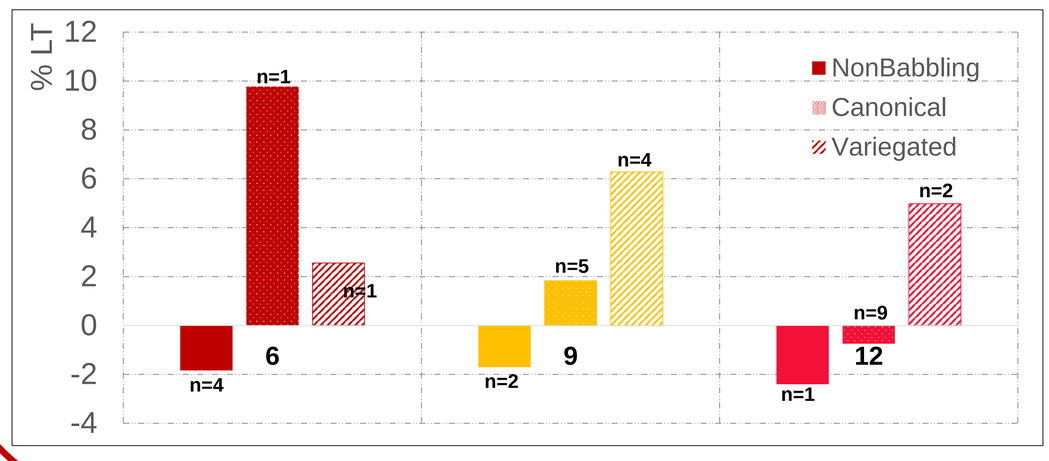
Effect of Production abilities

Non Babbling: **7** infants (4 6mo, 2 9mo, 1 12mo).
Canonical Babbling: **15** infants (2 6mo, 9 9mo, 4 12mo)
Variegated Babbling : **7** infants (1 6mo, 4 9mo, 2 12mo)

- No matching for NonBabbling & Canonical infants *(p>0.05).*
- Trend toward significant matching for Variegated infants *(p=0.09).*
- Trend toward better matching for Variegated than NonBabbling infants *(p=0.06).*



Interaction Age by Production abilities



Conclusion

- Infants showed a preference for videos pronouncing the consonant with which they had been familiarized.
  They performed intersensory matching in spite of the varying vowel context (invariance for plosive place of articulation?
- This performance seems to be present from 6 months of age comforting Hochmann et al.' results
- **Effect of production abilities**: infants producing [b] and/or [d] with varying vowels are better at matching than infants who don't produce the contrast, or who only produce the contrast with a single vowel.

Role of the perceptuo-motor link in categorization?

- No association in 12-month old infants: inadequate procedure? Emergence of the preference for new stimuli at 12mo?

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